REMARKS/ARGUMENTS

Brief Summary of Status

Claims 1-24 are pending in the application.

Claims 1-24 are rejected.

The specification is objected to because of line spacing.

The claims are objected to because of line spacing.

Specification

The Examiner asserts:

“2. The spacing of the lines of the specification is such as to make reading difficult. New application papers with lines 1 ½ or double spaced on good quality paper are required.” (final office action, Paper No./Mail Date 20071126, p. 4)

Claim Objections

The Examiner asserts:

“3. The claims are objected to because the lines are crowded too closely together, making reading difficult. Substitute claims with lines one and one-half or double spaced on good quality paper are required. See 37 CFR 1.52(b).” (final office action, Paper No./Mail Date 20071126, p. 4)

35 U.S.C. § 103 (starting page 4 of office action)

The Examiner asserts:

“5. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cherubini et al (US Patent Number 6,741,551) in view of De Gaudenzi et al (US Patent Number 7,123,663).” (hereinafter referred to as “Cherubini” and “De Gaudenzi”, respectively)(final office action, Paper No./Mail Date 20071126, p. 5)

Remarks

Specification

The Examiner asserts:

"2. The spacing of the lines of the specification is such as to make reading difficult. New application papers with lines 1 ½ or double spaced on good quality paper are required." (final office action, Paper No./Mail Date 20071126, p. 4)

The Applicant is submitting herewith a substitute specification that is double spaced.

The Applicant respectfully points out that the claims are **NOT** includes within the substitute specification since they are include above within this amendment/response.

Claim Objections

The Examiner asserts:

"3. The claims are objected to because the lines are crowded too closely together, making reading difficult. Substitute claims with lines one and one-half or double spaced on good quality paper are required. See 37 CFR 1.52(b)." (final office action, Paper No./Mail Date 20071126, p. 4)

The Applicant is submitting this response/amendment with the claims herein being double spaced.

35 U.S.C. § 103 (starting page 4 of office action)

The Examiner asserts:

"5. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cherubini et al (US Patent Number 6,741,551) in view of De Gaudenzi et al (US Patent Number 7,123,663)." (hereinafter referred to as "Cherubini" and "De Gaudenzi", respectively)(final office action, Paper No./Mail Date 20071126, p. 5)

The Applicant respectfully traverses.

The Examiner also asserts:

"**The examiner's response:** In abstract and in columns 6, lines 11-67 and column 7, lines 1-56, De Gaudenzi et al. clearly discloses optimize the transmitted signal

constellation taking into account the non-linear channel nature, together with the potential improvement of demodulation performance through simple constellation pre distortion. The examiner interpreting that optimizing the transmitted signal constellation points to be the re-ordering and/or rearranging of the order of encoded bits output." (final office action, Paper No./Mail Date 20071126, p. 2-3, emphasis added)

Within the ABSTRACT thereof (one portion which is cited by the Examiner), De Gaudenzi teaches and discloses:

"A new class of 16-ary Amplitude and Phase Shift Keying (APSK) coded modulations, called doublering APSK modulation, based on an amplitude and phase shift keying constellation in which the locations of the digital signals to be encoded are placed on two concentric rings of equally spaced signal points. The APSK constellation parameters are optimised so as to pre-compensate the impact of nonlinearities. The new modulation scheme is suited for being used with different coding schemes. It is shown that, for the same coding scheme, pre-distorted double-ring APSK modulation significantly outperforms classical 16-QAM and 16-PSK over a typical satellite channel, due to its intrinsic robustness against the high power amplifier non-linear characteristics. The proposed coded modulation scheme is shown to provide a considerable performance advantage for future satellite multi-media and broadcasting systems." (De Gaudenzi, ABSTRACT, emphasis added)

The Applicant respectfully asserts that there does not appear to be any indication of any indication that any re-ordering and/or rearranging of the order of encoded bits in this portion of De Gaudenzi.

It appears, in contradistinction, that the "APSK constellation parameters are optimised so as to pre-compensate the impact of nonlinearities". In other words, the "APSK constellation parameters are optimised", and there does not appear to be any indication that any re-ordering and/or rearranging of the order of encoded bits.

The Applicant in unable to find any definition in De Gaudenzi that "optimizing the transmitted signal constellation points" as cited by the Examiner means "re-ordering and/or rearranging of the order of encoded bits output".

However, in the SUMMARY OF THE INVENTION section, the Applicant respectfully points out that De Gaudenzi does provide definition that to "optimise the

signal constellation parameters" is performed in accordance with "minimum Euclidian distance and capacity maximization for linear and non-linear AWGN channels."

De Gaudenzi teaches and discloses:

"Another object of the invention is to optimise the signal constellation parameters according to minimum Euclidean distance and capacity maximization for linear and non linear AWGN channels." (De Gaudenzi, column 2, lines 38-41, emphasis added)

In addition, the Applicant respectfully points out that De Gaudenzi does provide further definition of the subject matter involving to "optimize the transmitted signal constellation parameters", and there does not appear to be any indication that any re-ordering and/or rearranging of the order of encoded bits therein.

De Gaudenzi teaches and discloses:

"The idea developed here is to optimize the transmitted signal constellation taking into account the nonlinear channel nature, together with the potential improvement of demodulation performance through simple constellation pre-distortion.

The constellation can be optimized by following two different approaches. The simplest, and probably the most intuitive way of looking into the problem is to compute all the possible distances between all different pairs of points in order to determine the minimum distance as a function of the parameters .rho. and .phi.. This approach, however, does not take into account the full geometric properties of the constellation. It is reasonable that the performance, in a general case, does depend on the set of all distances between pairs of constellation points. In this case, a formula is needed that exploit all these values. Constellation optimisation can be made by either maximizing the minimum constellation points distance or by determining the maximum channel capacity.

The minimum distance between constellation points can be determined by simple geometrical calculations." (De Gaudenzi, column 6, lines 6-41, emphasis added)

Therefore, a first of the "two different approaches" that can be employed, according to the explicit teaching and disclosure of De Gaudenzi is to "compute all the possible distances between all different pairs of points in order to determine the minimum distance as a function of the parameters .rho. and .phi.".

The Applicant respectfully points out that this does not appear include performing any re-ordering and/or rearranging of the order of encoded bits before they undergo mapping within a given constellation.

In contradistinction, the Applicant respectfully believes that, in accordance with the straight-forwarding teaching and disclosure of De Gaudenzi, this alternatively involves subject matter including to "compute all the possible distances between all different pairs of points in order to determine the minimum distance as a function of the parameters .rho. and .phi.".

Therefore, according to De Gaudenzi, this is the first approach of the "two different approaches" that De Gaudenzi defines as can be employed to for "optimizing the transmitted signal constellation points".

The Examiner nevertheless asserts that "The examiner interpreting that optimizing the transmitted signal constellation points to be the re-ordering and/or rearranging of the order of encoded bits output".

The Applicant respectfully believes that the explicitly disclosed means within De Gaudenzi of including to "compute all the possible distances between all different pairs of points in order to determine the minimum distance as a function of the parameters .rho. and .phi." is not the same as "re-ordering and/or rearranging of the order of encoded bits before they undergo mapping within a given constellation".

With respect to another means by which "constellation parameter" may be optimized, De Gaudenzi also teaches and discloses:

"The second constellation parameter to be optimized is the relative phase .phi. between the inner and outer ring points. Considering the constellation symmetry, it is easy to see that .phi. can be varied over the range (0, JI/N.sub.2) i.e. to maxima of 15 and 18 degrees respectively for the 4+12-APSK and 6+10- APSK cases. By utilizing the .rho.{opt} value previously found, no improvement is obtained by modifying .phi. for the first case as far as the maximum minimum distance is concerned.

Another approach for the optimization of the signal constellation over AWGN channels is to resort to information theory tools in order to compare the performance of coded digital modulation schemes. For our purposes, the relevant parameter is the channel capacity, i.e. the rate beyond which transmission with an arbitrarily low error

probability is possible, or equivalently, the maximum spectral efficiency achievable with a given modulation at a given SNR. In particular, the capacity of two-dimensional APSK constellations over a band-limited AWGN channel with no inter-symbol interference will be optimized as a function of N1, N.sub.2, .rho. and .phi..” (De Gaudenzi, column 6, lines 6-41, emphasis added)

Therefore, there appear to be these other means by which “constellation parameter” may be optimized as explicitly described by De Gaudenzi.

The Applicant respectfully points out that De Gaudenzi explicitly teaches and discloses that other means by which “constellation parameter” may be optimized include “second constellation parameter to be optimized is the relative phase .phi. between the inner and outer ring points” and “[a]nother approach for the optimization of the signal constellation over AWGN channels is to resort to information theory tools in order to compare the performance of coded digital modulation schemes”.

Nevertheless, the Examiner asserts that “The examiner interpreting that optimizing the transmitted signal constellation points to be the re-ordering and/or rearranging of the order of encoded bits output”.

The Applicant respectfully believes that these explicitly disclosed means within De Gaudenzi are not the same as “re-ordering and/or rearranging of the order of encoded bits before they undergo mapping within a given constellation”.

From one perspective, it can be seen that these means by which “constellation parameter” may be optimized correspond to the actual constellation itself (e.g., “compute all the possible distances between all different pairs of points in order to determine the minimum distance as a function of the parameters .rho. and .phi.”, “The second constellation parameter to be optimized is the relative phase .phi. between the inner and outer ring points” and “[a]nother approach for the optimization of the signal constellation over AWGN channels is to resort to information theory tools in order to compare the performance of coded digital modulation schemes”.

None of these means of De Gaudenzi explicitly teaches and discloses any re-ordering and/or rearranging of the order of encoded bits before they undergo mapping within a given constellation.

Given the fact that De Gaudenzi does in fact provide explicit definition for the means by which "constellation parameter" may be optimized, the Applicant respectfully believes that it is appropriate to look to those definitions as provided in De Gaudenzi rather that for the "The examiner interpreting that optimizing the transmitted signal constellation points to be the re-ordering and/or rearranging of the order of encoded bits output".

In even another portion, De Gaudenzi describes other operations to be performed to "optimize the non-linear channel performance", and it does not correspond to "re-ordering and/or rearranging of the order of encoded bits before they undergo mapping within a given constellation."

For example, De Gaudenzi also teaches and discloses:

"Before discussing the results for the non-linear channel, let us recall the relation between the input backoff (IBO) and the output back-off (OBO). As the input signal is non-constant envelope, the output power cannot be easily estimated by looking at the HPA AM/AM characteristic. For this reason a simulation approach was adopted. In order to optimize the non-linear channel performance, the quantity OBO(IBO) (dB)}+D(IBO)(dB)} should be minimized. Note that the 4+12-APSK pre-compensation is paid for by a slight increase in the OBO at low IBO." (De Gaudenzi, column 17, lines 23-33, emphasis added)

Nevertheless, the Examiner asserts that "De Gaudenzi et al. clearly discloses optimize the transmitted signal constellation taking into account the non-linear channel nature, together with the potential improvement of demodulation performance through simple constellation pre distortion. The examiner interpreting that optimizing the transmitted signal constellation points to be the re-ordering and/or rearranging of the order of encoded bits output."

However, De Gaudenzi teaches and discloses that "[i]n order to optimize the non-linear channel performance, the quantity OBO(IBO) (dB)}+D(IBO)(dB)} should be minimized."

Again, given the fact that De Gaudenzi does in fact provide explicit definition for the means by which "constellation parameter" may be optimized, the Applicant respectfully believes that it is appropriate to look to those definitions as provided in De

Gaudenzi rather that for the "<u>The examiner interpreting that optimizing the transmitted signal constellation points to be the re-ordering and/or rearranging of the order of encoded bits output</u>".

<u>Examiner's apparent OFFICIAL NOTICE</u>

As also cited below, the Examiner asserts:

"Applicants are remained that the Examiner is entitled to give the broadest reasonable interpretation to the language of the claim. <u>So the Examiner considers "optimizing constellation parameters" are "rearranging an order of the plurality of encoded bits" within the broad meaning of the term</u>. The Examiner is not limited to Applicant's definition, which is not specifically set fourth in the claims. *In* re *Tanaka et* &I 93 USPQ 139, (CCPA) 1977." (final office action, Paper No./Mail Date 20071126, p. 3, <u>emphasis added</u>)

The Applicant respectfully believes that it appears that the Examiner is taking **<u>OFFICIAL NOTICE</u>** that "<u>optimizing constellation parameters</u>" is the same as <u>"rearranging an order of the plurality of encoded bits" within the broad meaning of the term</u>.

The Applicant respectfully believes that it appears that the Examiner is taking **<u>OFFICIAL NOTICE</u>** that "<u>optimizing the transmitted signal constellation points to be the re-ordering and/or rearranging of the order of encoded bits output</u>".

As such, the Applicant respectfully requests that the Examiner provide supporting documents for such an **<u>OFFICIAL NOTICE</u>**.

The Applicant respectfully believes that it is, in contradistinction, appropriate to look at the actual reference of De Gaudenzi and the definitions provided therein as to what is meant by "<u>optimizing the transmitted signal constellation points</u>".

The Applicant has cited many of these portions of De Gaudenzi, and the Applicant in unable to find any indication of "<u>re-ordering and/or rearranging of the order of encoded bits output</u>" in these cited portions.

Again, the Applicant is unable to find any indication that any re-ordering and/or rearranging of the order of encoded bits output from the "figure 11, Trellis Encoder" of De Gaudenzi. Considering FIG. 11 of De Gaudenzi, it appears that the output from the "Trellis Encoder" therein is passed directly to the "Mapper" without any rearranging

and/or re-ordering of the order of encoded bits output from the "figure 11, Trellis Encoder".

The Applicant respectfully believes that straight-forward teaching and disclosure of De Gaudenzi does in fact teach and disclose various means by which there may be "optimizing the transmitted signal constellation points", and the Applicant respectfully believes that these means described within De Gaudenzi do not include "re-ordering and/or rearranging of the order of encoded bits output" therein.

In contradistinction, to the "the Examiner considers "optimizing constellation parameters" are "rearranging an order of the plurality of encoded bits" within the broad meaning of the term", the Applicant respectfully believes that one having skill in the art, when provided De Gaudenzi, would clearly understand that De Gaudenzi teaches and discloses means by which "constellation parameter" may be optimized correspond to the actual constellation itself (e.g., "compute all the possible distances between all different pairs of points in order to determine the minimum distance as a function of the parameters .rho. and .phi.", "The second constellation parameter to be optimized is the relative phase .phi. between the inner and outer ring points" and "[a]nother approach for the optimization of the signal constellation over AWGN channels is to resort to information theory tools in order to compare the performance of coded digital modulation schemes").

As such, the Applicant respectfully believes that the combination of Cherubini and De Gaudenzi, when considered individually or in combination, fail to teach and disclose each and every limitation of the subject matter as claimed by the Applicant.

The Applicant is unable to find any indication that any re-ordering and/or rearranging of the order of encoded bits output from the "figure 11, Trellis Encoder" of De Gaudenzi. Considering FIG. 11 of De Gaudenzi, it appears that the output from the "Trellis Encoder" therein is passed directly to the "MAPPER" without any rearranging and/or re-ordering of the order of encoded bits output from the "figure 11, Trellis Encoder".

A relevant corresponding written description portion of De Gaudenzi is provided here, in which De Gaudenzi teaches and discloses:

"The performance of the 4+12-APSK modulation scheme will first be considered when used with trellis coding. FIG. 11 shows a block diagram of the end-to-end TCM system under consideration. The binary information data bits b.sub.k at rate R.sub.b enter a serial-to-parallel device S/P generating three parallel streams at rate R.sub.b'=R.sub.b/3. The rate r=3/4 trellis coder generates four parallel binary symbol streams at rate R.sub.s=R.sub.b'/(r log.sub.2M) that are mapped through an Ungerboeck mapper to the 16-ary constellation generator. The I-Q multilevel digital pulse stream is then passed to the two baseband SRRC filters and I-Q modulated at RF. In case of the non-linear channel, the passband real signal then drives the HPA. Addictive White Gaussian Noise AWGN representative of the downlink satellite channel is then added." (De Gaudenzi, column 13, line 63 to column 14, line 10, emphasis added)

The Applicant respectfully points out that De Gaudenzi teaches and discloses that "rate r=3/4 trellis coder generates four parallel binary symbol streams", and there is no indication in De Gaudenzi that these "parallel binary symbol streams" include bits therein that have undergone any rearranging and/or re-ordering.

There does not appear to be any indication of any indication that any re-ordering and/or rearranging of the order of encoded bits in this portion of De Gaudenzi.

In response to the Applicant's arguments of "**(2) Applicant's arguments:** "encoding a subset of information bits of the plurality of information bits into the plurality of encoded bits; and mapping the plurality of encoded bits and at least one uncoded information bits into a plurality of modulation symbols according to a symbol constellation and a corresponding mapping function, thereby generating the sequence of discrete-valued modulation symbols", the Examiner also asserts:

"**The examiner's response:** In figure 11, De Gaudenzi et al. clearly illustrates plurality of encoded bits output from the TURBO ENCODER and being mapped by the MAPPER. Moreover, the constellation generator is generating constellation points corresponding mapping function. Please see columns 6, lines 11-67 and column 7, lines 1-56 for clear description of the process.

Applicants are remained that the Examiner is entitled to give the broadest reasonable interpretation to the language of the claim. So the Examiner considers

"optimizing constellation parameters'' are "rearranging an order of the plurality of encoded bits" within the broad meaning of the term. The Examiner is not limited to Applicant's definition, which is not specifically set fourth in the claims. *In* re *Tanaka et* &I 93 USPQ 139, (CCPA) 1977." (final office action, Paper No./Mail Date 20071126, p. 3)

The Applicant respectfully points out that the Applicant comments include "**at least one uncoded information bit**".

The Applicant respectfully agrees with the Examiner, in that, "In figure 11, De Gaudenzi et al. clearly illustrates plurality of encoded bits output from the TRELLIS ENCODER and being mapped by the MAPPER". However, there are no uncoded bits that are mapped by the MAPPER in figure 11, De Gaudenzi. Uncoded bits would be those bits which have not undergone encoding within the TRELLIS ENCODER in figure 11, De Gaudenzi and yet are still provided to the MAPPER.

As can be seen in figure 11, De Gaudenzi, there are no signal paths that bypass the TRELLIS ENCODER in figure 11, De Gaudenzi and are provided to the MAPPER.

The "**examiner's response**" to these comments/arguments made by the Applicant have no reference or mention whatsoever to any "uncoded information bit".

As such, the Applicant respectfully requests that the Examiner address that Applicant's subject matter and comments related to "at least one uncoded information bit".

As such, the Applicant respectfully asserts that combination of Cherubini and De Gaudenzi fails to teach and disclose each and every element of the subject matter as claimed by the Applicant in independent claims 1 and 13.

In view of at least these comments made above, the Applicant respectfully believes that independent claims 1 and 13 are patentable over Cherubini in view of De Gaudenzi.

The Applicant respectfully believes that the dependent claims within claims 1-24, being further limitations of the subject matter as claimed in independent claims 1 and 13, respectively, are also allowable.

As such, the Applicant respectfully requests that the Examiner withdraw the rejections of claims 1-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Cherubini in view of De Gaudenzi.

The Applicant respectfully believes that claims 1-24 are in condition for allowance and respectfully requests that they be passed to allowance.

The Examiner is invited to contact the undersigned by telephone or facsimile if the Examiner believes that such a communication would advance the prosecution of the present U.S. utility patent application.

RESPECTFULLY SUBMITTED,

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